

SANDWICH MOLDING METHOD OF RESIN MOLDED ARTICLE, MOLDING DEVICE THEREOF, AND RESIN MOLDED ARTICLE

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Abstract

PROBLEM TO BE SOLVED: To heighten the secondary resin packing in the boss part of a resin sandwich molded article.

SOLUTION: A sub-cavity 8 is continuously connected through a leading-out passage 7 to a recessed part 6 corresponding to a boss part. The volume of the sub-cavity 8 is made variable by moving a piston 12. When a primary and a secondary resins 13 and 14 injected from a two-color molder consisting of a primary and a secondary cylinders 1 and 2 fill a cavity 3, the piston 12 is retreated from the sub-cavity 8 so as to enlarge the volume of the sub-cavity in order to pull the primary resin 13 from within the recessed part 6 in the enlarged sub-cavity 8, resulting in leading the secondary resin 14 in the recessed part 6 through the above-mentioned pulling-in.

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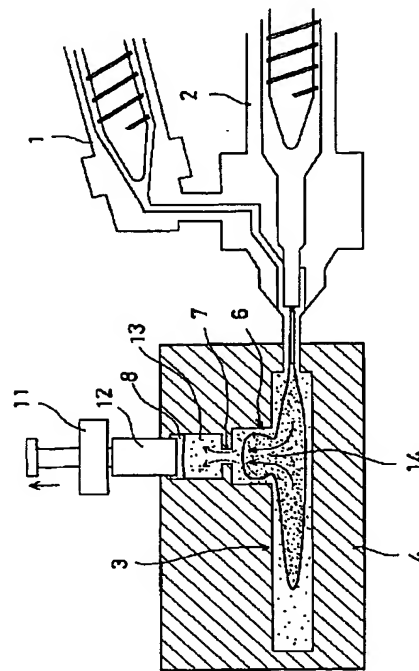
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(54) 【発明の名称】 樹脂成形品のサンドイッチ成形方法及びその成形装置並びに樹脂成形品

(57) 【要約】

【課題】 樹脂サンドイッチ成形品におけるボス部内の二次樹脂充填率を高める。

【解決手段】 ボス部に相当した凹部6に、導出路7を介して副キャビティ8を連設し、その副キャビティ8は、ピストン12の進退により容積を可変とする。一次及び二次シリンダ1、2とで構成される二色成形機から射出された一次及び二次樹脂13、14がキャビティ3内に充填したら、前記ピストン12を副キャビティ8から退避させて副キャビティの容積を拡大させ、凹部6内から拡大された副キャビティ8内に一次樹脂13を引き込み、その引き込みにより二次樹脂14を凹部6内に導入する。



【特許請求の範囲】

【請求項1】 出っ張り部を有する製品形状の主キャビティにおける少なくとも前記出っ張り部に相当する空間に、導出路を介して容積可変の副キャビティを連設し、前記主キャビティ内に、二色成形機から主キャビティの容積を超過する量に相当する第一及び第二の樹脂を射出する段階で、前記主キャビティ内に所定量の樹脂が充満したとき、前記副キャビティの容積を拡大して主キャビティ内に充満した両樹脂の一部を副キャビティ内へ導入し、前記主キャビティの出っ張り部に相当する空間に二次樹脂を引き入れる樹脂成形品のサンドイッチ成形方法。

【請求項2】 出っ張り部を有する製品形状の主キャビティと、その主キャビティ内に第一の樹脂と第二の樹脂とを射出する二色成形機とを備え、前記主キャビティには、少なくとも出っ張り部に相当する空間に導出路を介して容積可変の副キャビティを連設し、その副キャビティの容積拡大タイミングをコントロール可能とした樹脂成形品のサンドイッチ成形装置

【請求項3】 前記副キャビティが、その副キャビティ内に嵌入されるピストンの進退動作によって容積可変となっている請求項2に記載した樹脂成形品のサンドイッチ成形装置。

【請求項4】 前記副キャビティを1つの出っ張り部に相当する空間に対して複数設けた請求項2に記載した樹脂成形品のサンドイッチ成形装置。

【請求項5】 前記副キャビティの最大容積を可変とした請求項2又は3に記載した樹脂成形品のサンドイッチ成形装置。

【請求項6】 前記副キャビティの容積拡大速度を可変とした請求項2～4の何れかに記載した樹脂成形品のサンドイッチ成形装置。

【請求項7】 前記請求項1又は2のいずれかの成形方法により形成された樹脂成形品。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】本発明は出っ張り部を有した樹脂成形品のサンドイッチ成形技術に関する。

【0002】

【従来技術】樹脂成形品のサンドイッチ成形技術は、二色成形機を利用して同一キャビティ内にスキン層（表層）形成用の一次樹脂と同時、或いはそれより遅く短いタイミングでコア層（中心層）形成用の二次樹脂を射出し、内外二重構造の樹脂成形品を形成するもので、コア層に発泡性樹脂を使用して製品重量及び材料使用量の低減を図ったり、コア層に廉価な樹脂を使用することによりトータルコストを下げるのには効果的であるし、又、コア層を強度の高い材料で形成し、スキン層には摺動性に優れ、或いは感触の良い高価な材料を使用して付加価値を高めることができるので、利用価値は高い。

【0003】

【発明が解決しようとする課題】二色成形機を利用して例えば図8に示すような矩形の薄板製品を形成すると、先端部分Aでは、コア層19は幅が狭く薄い、中央部分のBでは幅広く而も厚く形成され、ゲート5に近い基端側部分Cに至っては狭く厚いといったようにコア層19が均一に分布していない。又、前記薄板製品の表面にボス部を一体形成すると、射出された樹脂のうち、二次樹脂はキャビティの中央部分に集中し、ボスや座等のような小さな出っ張り部を有した製品形状のキャビティにあっては、図9に例示するように、出っ張り部としてのボス部に相当した凹部6内にはスキン層形成用の一次樹脂13は入り込むものの、二次樹脂14は凹部6内にまで充分侵入せず、ボス部はコア層を有しないスキン層のみ、或いはコア層が殆ど含まれていない構造に形成されてしまうので、出っ張り部にはサンドイッチ成形の利点が生かされない。

【0004】

【課題を解決するための手段】本発明は、二次樹脂を出っ張り部内に充填可能とするサンドイッチ成形技術であって、その構成は、出っ張り部を有する製品形状の主キャビティにおける少なくとも前記出っ張り部に相当する空間に、導出路を介して容積可変の副キャビティを連設し、前記主キャビティ内に、二色成形機から主キャビティの容積を超過する量に相当する第一及び第二の樹脂を射出する段階で、前記主キャビティ内に所定量の樹脂が充満したとき、前記副キャビティの容積を拡大して主キャビティ内に充満した両樹脂の一部を副キャビティ内へ導入し、前記主キャビティの出っ張り部に相当する空間に二次樹脂を引き入れる樹脂成形品のサンドイッチ成形方法と、出っ張り部を有する製品形状の主キャビティと、その主キャビティ内に第一の樹脂と第二の樹脂とを射出する二色成形機とを備え、前記主キャビティには、少なくとも出っ張り部に相当する空間に導出路を介して容積可変の副キャビティを連設し、その副キャビティの容積拡大タイミングをコントロール可能とした樹脂成形品のサンドイッチ成形装置、及び前記方法により形成された樹脂成形品とにある。そして前記装置は、副キャビティが、その副キャビティ内に嵌入されたピストンの進退動作によって容積可変としたり、副キャビティの最大容積を可変としたり、副キャビティの容積拡大速度を可変とすることができる。

【0005】

【発明の実施の形態】本発明に係る樹脂成形品のサンドイッチ成形装置及び方法並びに成型品の実施例を図面に基いて説明する。図1は本発明に係る成形装置を示したもので、1は一次シリンダ、2は二次シリンダ、3は金型4内に形成される主キャビティであって、主キャビティ3は、幅120mm、長さ200mm、厚み6.5mmの薄い矩形で、一側面の中央にはゲート5が設けら

れている。そして前記主キャビティ3の上面には成形品の出っ張り部であるボスに相当した凹部6が形成されており、この凹部6は径が40mm、高さが40mmの筒状で、この凹部6には、導出路7介して副キャビティ8が設けられている。前記ゲート5は、金型4内に形成されているスプルー9を介して、一次シリンダ1の射出口内に同軸で配置された二次シリンダ2の射出口を有する内外二重構造のノズル10に接続されていて、前記一次シリンダ1、二次シリンダ2、及びノズル10とにより二色成形機が構成されている。前記副キャビティ8には、油圧シリンダ11により強制的に進退動作されるピストン12が、前記副キャビティ8に対し、その副キャビティ8内の全領域を占有するまで進出した位置と、副キャビティ8から完全に撤退するまで退避した位置との間を移動し、副キャビティ8の容積を可変とするよう組み付けられている。

【0006】前記一次シリンダ1と二次シリンダ2とを有した二色成形機を備えた装置からは、スキン層形成用の一次樹脂とコア層形成用の二次樹脂とが射出され、二次シリンダ2から射出された二次樹脂は、一次シリンダ1から射出された一次樹脂の中心部分に充填される。前記射出のタイミングは、一次樹脂が二次樹脂より僅かに速く射出を開始し、二次樹脂より僅かに遅く終了するよう設定されているが、変更も可能となっている。実施例では、スキン層を形成する一次樹脂に、メルトインデックス値(ASTM D1239に準拠して測定した温度190度C、荷重2.16Kgにおける値)が9.2

(g/10分)のポリアセタールを使用し、コア層を形成する二次樹脂には、メルトインデックス値が3.6

(g/10分)の耐衝撃ポリスチレンを使用した。又成形条件は、一次樹脂側、二次樹脂側ともに、シリンダ温度190度C、射出速度67mm/秒、一次樹脂を射出してから二次樹脂を射出するまでの時間差1.5秒、射出充填時の最高樹脂圧力及び射出充填後の保圧力30MPa、金型温度60度C、冷却時間85秒とした。

【0007】先ず、比較例として、ピストン12を進出させ、副キャビティ8内の空間を完全に占有した状態でピストン12を停止させたまま、前記条件下にて一次樹脂13と二次樹脂14とを主キャビティ3内に射出し、成形品を調べた。その結果は、前記従来例で示した副キャビティを有しない装置と変わりなく、図2に例示するように、二次樹脂14が凹部6内へ僅かに進出した射出パターンとなった。

【0008】次に、実施例として、本発明の方法により成形すべく、樹脂の充填に先立って、前記と同様にピストン12を副キャビティ8内に進出させておいて、一次樹脂13が主キャビティ3内いっばいに行き渡った前記図2に示す時点で、図3の如くピストン12を副キャビティ8内から退避させると共に、前記二色成形機から一次樹脂と二次樹脂とのトータルがキャビティの容積を超

過する量となるよう追加し、射出終了時は、一次樹脂のみが射出されるようにコントロールした。ピストン12を副キャビティ8から退避させることにより、副キャビティ8が拡大され、その拡大された副キャビティ8内に導出路7を通して凹部6内の一次樹脂13が吸引され、それに伴い、凹部6内には一次樹脂13と一緒に二次樹脂14が引き込まれ、凹部6内には一次樹脂13と二次樹脂14とが充填される。成形品を調べたところ、ボス部内には先端から30mm、20mm、10mmの各ポイントに、コア層が少なくとも50%以上存在し、従来の手段では不可能であった出っ張り部の先端部分にまでコア層を形成することが可能であることを確認できた。図4は、前記ピストンを動作させない比較例とピストンを動作させた実施例との各ポイントにおける二次樹脂の充填率を示したものである。尚、副キャビティ8内に充填された樹脂は、成形完了後、導出路7の部分でカットし、分離すればよい。

【0009】このようにして一次樹脂13と二次樹脂14とが凹部8内に充填されれば、成形品のボス部も母体と同じ特性を有した構造となるし、母体とボス部のコア層は互いに連続していて、一体的な要素も高い。そして前記金型を、既設の装置に装着されている金型との交換することにより、既設の装置を利用して本発明の実施が可能である。

【0010】ところで二次樹脂の充填パターンは一次樹脂とのレオロジー特性のバランスに大きく依存するため、例えば二次樹脂が一次樹脂に比べて高い粘性を有する場合は二次樹脂の割合が少なく、図5の(a)に例示するように二次樹脂14は広範囲には拡がらないし、逆の場合は図5の(b)に例示するように広範囲に拡がって大半が二次樹脂14によって占領されるといったように、同じ形状のキャビティ形状でも一次樹脂と二次樹脂との組み合わせが変われば当然二次樹脂の充填パターンも異なるし、キャビティ全体や、凹部の形状が、例えば細く長いとか太く短いとかに変わっても、キャビティや凹部内への充填パターンは大きく違ってくる。従って両者のレオロジーのバランスの違いにより、ピストンを動作させるタイミングや速度、ストローク等をコントロールするよう配慮する。

【0011】成形機には油圧回路が必須であるから、前記ピストンの動作には油圧シリンダを好適に利用することができ、射出タイミングは、例えば二色成形機の射出開始信号を拾い、遅延動作させるなど、容易にコントロールできる。又、ピストンの動作は油圧シリンダ以外のアクチュエータを利用することもでき、動作タイミングや速度を、主キャビティの形状に応じて調整可能とすることが望ましい。更に、副キャビティの容積は、例えば図6の(a)に例示するように、スペーサ15を用いてピストン12の退避量を制限し、副キャビティ8内に引き込む一次樹脂の量を減らしたり、図6の(b)に例示

するように、スペーサ16を用いて副キャビティ8内に空間17が形成されるよう進出量を抑え、前記空間17内が樹脂が流れ込んだ後、ピストンを退避せしめて強制的に引き込むなど、副キャビティの最大容積や容積変化量を調整可能とすることができる。無論、大きさの異なる副キャビティを複数用意しておき、交換してもかまわない。尚、前記実施例においては、副キャビティの容積拡大に際してピストンを油圧シリンダで強制的に退避させているが、前記ピストンと油圧シリンダのピストンロッドとを連結せず、油圧シリンダはピストンを副キャビティ内に進出せしめ、容積拡大時にピストンロッドのみを後退させ、進出状態にあるピストンは、主キャビティ内に射出された樹脂圧で後退するようにもできる。又、副キャビティの容積は連続的に変化させるばかりでなく、例えば導出路に開閉機構を設け、開閉機構が閉塞状態で最小容積の副キャビティを、開閉機構の開動作で最大に切り換えする容積可変構造としても差し支えない。

【0012】前記実施例では凹部にのみに副キャビティが連設されているが、図7の(a)に例示するように、ゲート5から離れた主キャビティ3の先端部位にも副キャビティ18を連設し、主キャビティ3内の二次樹脂を先端側まで分布させたりできる。その場合、先端に連設する副キャビティ18は、ピストンを強制的に退避させるばかりでなく、主キャビティ内に射出された樹脂の圧力で押し戻されることにより副キャビティの容積を可変とする構造や、容積が変化しない一定容積の構造でもかまわない。

【0013】更に副キャビティは出っ張り部分の突出方向に形成するばかりでなく、突出方向に対して側方に形成、或いは図7の(b)に示すように、凹部6の左右両側に副キャビティ8、8を一つずつ設けるなど、副キャビティの連設位置、数、容積可変の構造などは本発明の趣旨を逸脱しない範囲内で適宜変更できる。副キャビティを多数設けることで、腕のように長く延びた出っ張り部の先端にまで二次樹脂を導入することも不可能ではない。そして本発明の方法において、一次樹脂と二次樹脂との射出タイミング、副キャビティの拡大タイミングは、樹脂の種類や製品が要求する形態などといった条件に応じて適宜変更される。

【0014】

【発明の効果】本発明のサンドイッチ成形方法によれば、副キャビティの容積を拡大することにより、副キャビティ内に一次樹脂を引き込み、その一次樹脂が引き込まれる流れに乗って二次樹脂を凹部内に充填させることができる。又副キャビティに対して進出、退避するピストンを設けた装置は、前記本発明の樹脂サンドイッチ成形方法を容易に実施できるし、前記方法で形成された成形品は出っ張り部内にコア層が形成されているので、出っ張り部の特性は母体と同じレベルとなる。そしてキャビティの容積をピストンの進退動作により可変とすれば、可動部分はピストンのみであるから構造が簡単となり、1つの出っ張り部に対して複数の副キャビティを設けたり、副キャビティの容積拡大速度を可変としたりすれば、異なる出っ張り部にも対応できる。更に、本発明の樹脂成型品は、出っ張り部にもサンドイッチ成形のメリットが生かされる。

【図面の簡単な説明】

【図1】本発明に係る樹脂サンドイッチ成形方法を実施するための装置を示す説明図である。

【図2】副キャビティの容積が最小状態における射出パターンの説明図である。

【図3】副キャビティの容積を拡大した状態における射出パターンの説明図である。

【図4】比較例と実施例との違いを示した比較表である。

【図5】粘性が違う組み合わせにより射出パターンの違いを例示した説明図である。

【図6】変更例の説明図である。

【図7】変更例の説明図である。

【図8】サンドイッチ成形品の典型的な例を示した説明図である。

【図9】従来例の説明図である。

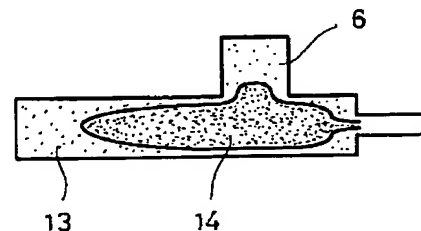
【符号の説明】

1・・・一次シリンダ、2・・・二次シリンダ、3・・・主キャビティ、4・・・金型、5・・・ゲート、6・・・凹部、7・・・導出路、8・・・副キャビティ、9・・・スプルー、10・・・ノズル、11・・・油圧シリンダ、12・・・ピストン、13・・・一次樹脂、14・・・二次樹脂、15、16・・・スペーサ、17・・・空間、18・・・副キャビティ、19・・・コア層。

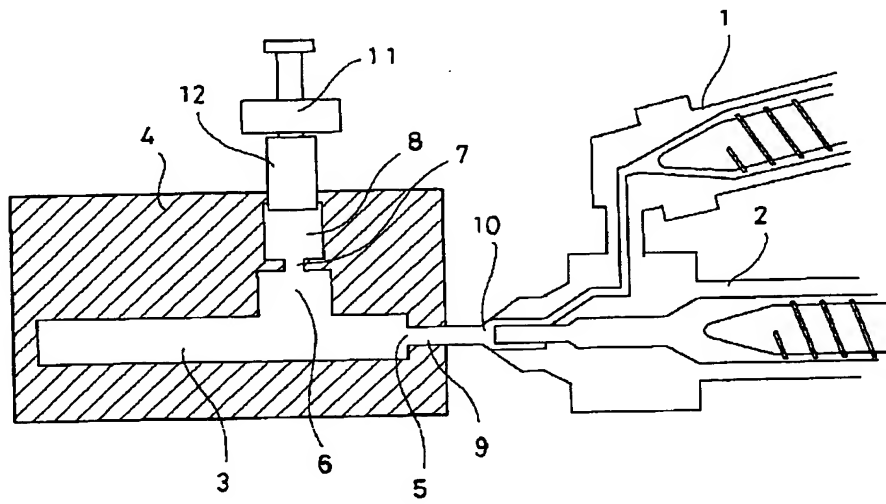
【図4】

| 測定位置：円柱上端より | 30mmポイント | 20mmポイント | 10mmポイント |
|-------------|----------|----------|----------|
| 実施例 | 81% | 72% | 58% |
| 比較例 | 49% | 0% | 0% |

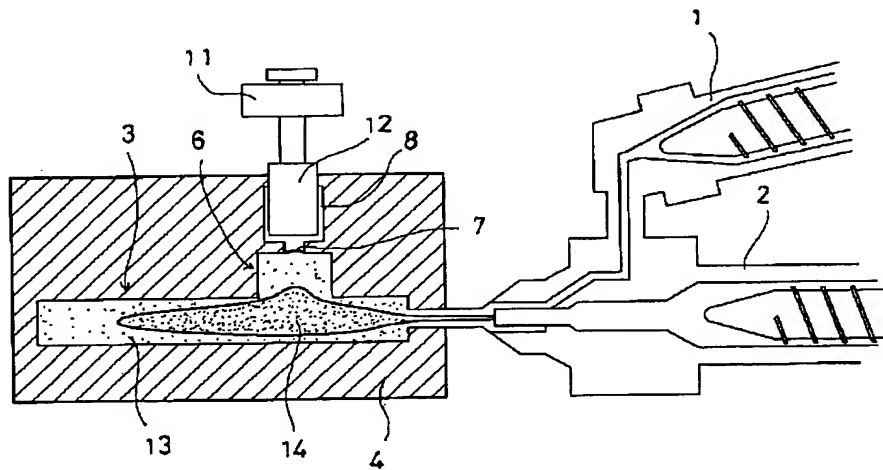
【図9】



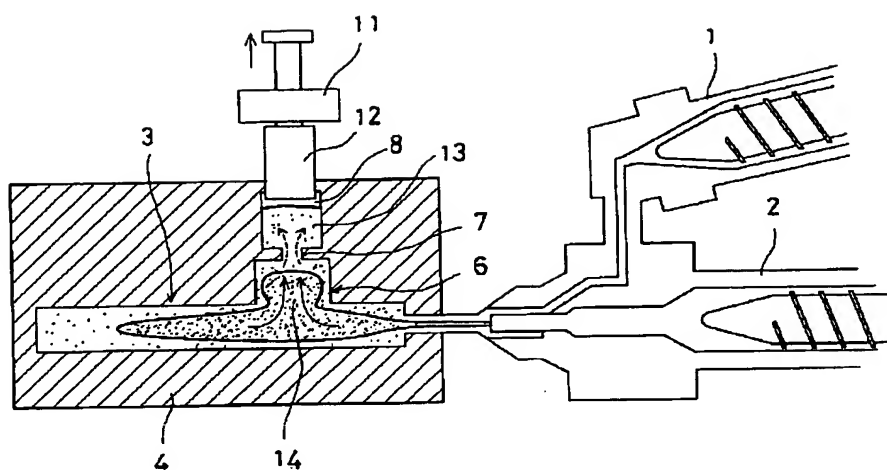
【図1】



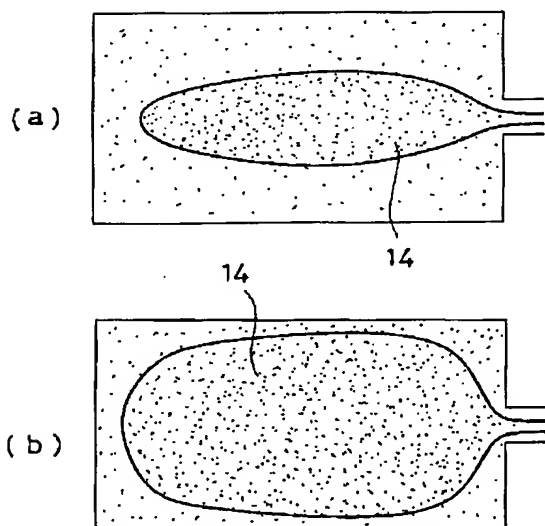
【図2】



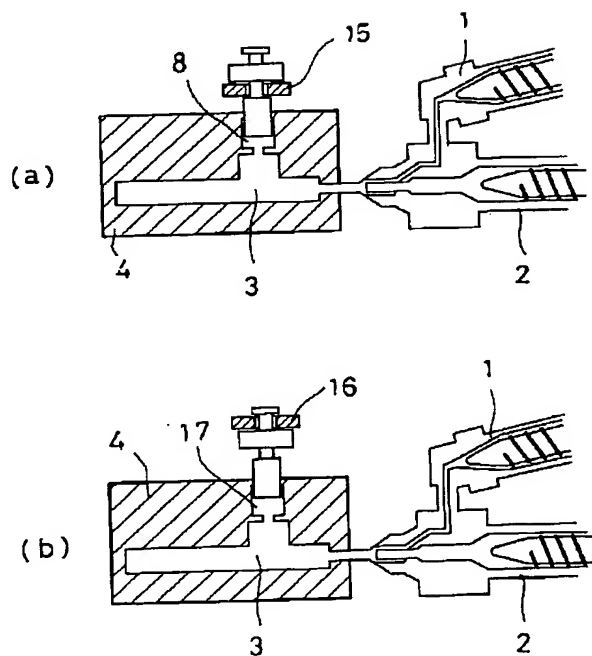
【図3】



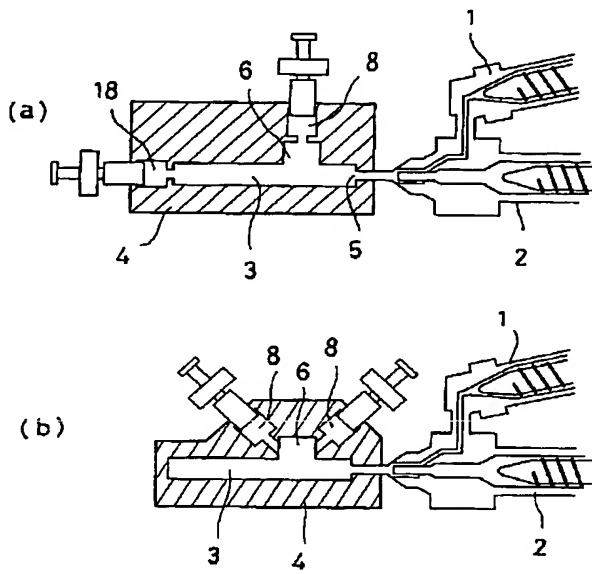
【図5】



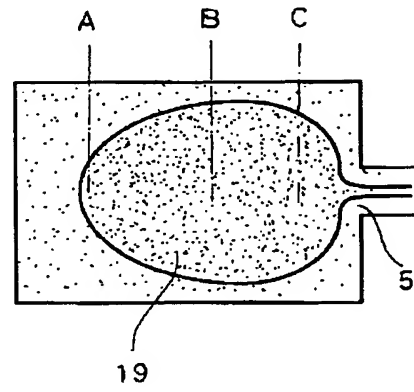
【図6】



【図7】



【図8】



*** NOTICES ***

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1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. **** shows the word which can not be translated.
3. In the drawings, any words are not translated.

[Claim(s)]

[Claim 1] To the space in the main mold cavity of the product configuration which has the lug section which is equivalent to the aforementioned lug section at least In the phase of injecting the first equivalent to the amount which forms capacity adjustable submold cavities successively through a derivation way, and exceeds the capacity of the main mold cavity from a two-color-molding machine in the aforementioned main mold cavity, and the second resin The sandwiches molding technique of resin mold goods of drawing a secondary resin into the space which introduces a part of both resins which the capacity of the aforementioned submold cavity was expanded and it was full of in the main mold cavity when the resin of the specified quantity was full in the aforementioned main mold cavity into a submold cavity, and is equivalent to the lug section of the aforementioned main mold cavity.

[Claim 2] Sandwiches molding equipment of the resin mold goods which formed capacity adjustable submold cavities successively through the derivation way to the space which is equipped with the two-color-molding machine which injects the first resin and second resin in the main mold cavity and the main mold cavity of the product configuration which has the lug section, protrudes at least in the aforementioned main mold cavity, and is equivalent to the section, and used capacity expansion timing of the submold cavity as controllable [a claim 3] Sandwiches molding equipment of the resin mold goods indicated to the claim 2 from which the aforementioned submold cavity serves as the capacity adjustable by attitude operation of the piston inserted in the submold cavity.

[Claim 4] Sandwiches molding equipment of the resin mold goods indicated to the claim 2 which prepared two or more aforementioned submold cavities to the space equivalent to the one lug section.

[Claim 5] Sandwiches molding equipment of the resin cast which indicated the maximum capacity of the aforementioned submold cavity to the claim 2 made adjustable or 3.

[Claim 6] Sandwiches molding equipment of the resin cast which indicated the capacity expansion speed of the aforementioned submold cavity to either of the claims 2-4 made adjustable.

[Claim 7] Resin mold goods formed by the molding technique of the aforementioned claim 1 or either of 2.

[Detailed Description of the Invention]

[0001]

[The technical field to which invention belongs] this invention relates to the sandwiches forming technique of the resin mold goods with the lug section.

[0002]

[Description of the Prior Art] The sandwiches forming technique of resin mold goods uses a two-color-molding machine. The primary resin for skin (cortex) formation in the same mold cavity, and simultaneous, Or it is what injects the secondary resin for core layer (main layer) molding to short timing later than it, and forms the resin mold goods of inside-and-outside dual structure. A foaming nature resin is used for a core layer. aim at a reduction of a product weight and the amount of the material used, or It is effective for lowering a total cost by using a cheap resin for a core layer, and since a core layer is formed with the material with a high intensity, and it excels in a skin at sliding nature or value added can be raised using the expensive good material of the touch, utility value is high.

[0003]

[Problem(s) to be Solved by the Invention] If ** is also broadly formed thickly at B for a center section although the core layer 19 has narrow width of face and it is thin in point part A when the sheet metal product of a rectangle which is shown in drawing 8 , using a two-color-molding machine is formed, and it resulted in base one end partial C near the gate 5, as it said that it was narrowly thick, the core layer 19 is not distributed uniformly. Moreover, the inside of the resin injected when the boss section was really formed in the front face of the aforementioned sheet metal product, If it concentrates on a part for the center section of a mold cavity and a secondary resin is in the mold cavity of the product configuration with the small lug sections, such as a boss and a seat Although the primary resin 13 for skin formation enters in a concavity 6 considerable the bottom at the boss section as lug section so that it may illustrate to drawing 9 The secondary resin 14 does not invade enough even in a concavity 6, and since the boss section will be formed in the structure where the core layer is hardly contained only for the skin which does not have a core layer, the advantage of sandwiches molding is not efficiently employed in the lug section.

[0004]

[Means for Solving the Problem] this invention is sandwiches forming technique which protrudes and enables restoration of a secondary resin at circles. the configuration To the space in the main mold cavity of the product configuration which has the lug section which is equivalent to the aforementioned lug section at least In the phase of injecting the first equivalent to the amount which forms capacity adjustable submold cavities successively through a derivation way, and exceeds the capacity of the main mold cavity from a two-color-molding machine in the aforementioned main mold cavity, and the second resin When the resin of the specified quantity is full in the aforementioned main mold cavity, a part of both resins which the capacity of the aforementioned submold cavity was expanded and it was full of in the main mold cavity are introduced into a submold cavity. The sandwiches molding technique of resin mold goods of drawing a secondary resin into the space equivalent to the lug section of the aforementioned main mold cavity, It has the two-color-molding machine which injects the first resin and second resin in the main mold cavity and the main mold cavity of the product

configuration which has the lug section. to the aforementioned main mold cavity Capacity adjustable submold cavities are formed successively through a derivation way to the space which protrudes at least and is equivalent to the section, and it is in the resin mold goods formed by the sandwiches molding equipment and the aforementioned technique of the resin mold goods which used capacity expansion timing of the submold cavity as controllable. And a submold cavity can make the aforementioned equipment capacity adjustable by attitude operation of the piston inserted in the submold cavity, it can make the maximum capacity of a submold cavity adjustable, or can make adjustable the capacity expansion speed of a submold cavity.

[0005]

[Embodiments of the Invention] The example of the sandwiches molding equipment of the resin mold goods concerning this invention, technique, and a cast is explained based on a drawing. Drawing 1 is what showed the molding equipment concerning this invention, 1 is the main mold cavity by which a primary cylinder and 2 are formed in a secondary cylinder, and 3 is formed in metal mold 4, the main mold cavities 3 are the width of face of 120mm, the length of 200mm, and a thin rectangle with a thickness of 6.5mm, and the gate 5 is formed in the center of the 1 side face. And the concavity 6 is formed in the top of the aforementioned main mold cavity 3 considerable the bottom at the boss who is the lug section of mold goods, this concavity 6 is tubed [40mm and a tubed height are 40mm], a path minds [this / 6] it derivation way 7, and the submold cavity 8 is formed. The aforementioned gate 5 is connected to the nozzle 10 of the inside-and-outside dual structure which has the injection opening of the secondary cylinder 2 arranged on the same axle in the injection opening of the primary cylinder 1 through the sprue 9 currently formed in metal mold 4, and the two-color-molding machine is constituted by the aforementioned primary cylinder 1, the secondary cylinder 2, and the nozzle 10. The piston 12 by which an attitude operation is compulsorily carried out with an oil hydraulic cylinder 11 at the aforementioned submold cavity 8 moves between the position which marched out until it occupied all the fields in the submold cavity 8 to the aforementioned submold cavity 8, and the positions evacuated until it withdrew from the submold cavity 8 completely, and it is attached so that the capacity of the submold cavity 8 may be made adjustable.

[0006] A part for the core of the primary resin injected from the primary cylinder 1 is filled up with the secondary resin which the primary resin for skin formation and the secondary resin for core stratification were injected from the equipment equipped with the two-color-molding machine with the aforementioned primary cylinder 1 and the secondary cylinder 2, and was injected from the secondary cylinder 2. Change is also possible although the timing of the aforementioned injection is set up so that a primary resin may start injection quickly slightly from a secondary resin and may be slightly completed late from a secondary resin. In the example, the melt index value (value in 2.16kg of the temperature of 190 degrees C and the loads which were measured based on ASTM D1239) used the polyacetal of 9.2 (g / 10 minutes) at the primary resin which forms a skin, and the melt index value used the impact-proof polystyrene of 3.6 (g / 10 minutes) for the secondary resin which forms a core layer. Moreover, the primary resin and secondary resin side made the process condition the highest resin pressure at the time of injection restoration and dwelling force 30Mpa after injection restoration, 60 degrees C of die temperatures, and cooldown-delay 85 seconds for time difference 1.5 seconds

after injecting 190 degrees C of cylinder temperatures, a 67mm [/second] injection speed, and a primary resin until it injects a secondary resin.

[0007] First, as an example of a comparison, the piston 12 was made to march out, the primary resin 13 and the secondary resin 14 were injected in the main mold cavity 3 under the aforementioned condition, stopping a piston 12, where the space in the submold cavity 8 is occupied completely, and mold goods were investigated. The result was as unchanging as the equipment which does not have the submold cavity shown in the aforementioned conventional example, and the secondary resin 14 became the injection pattern which marched out slightly into the concavity 6 so that it might illustrate to drawing 2 .

[0008] Next, restoration of a resin is preceded as an example that it should fabricate by the technique of this invention. When a piston 12 is shown in the aforementioned view 2 round which it was made to march out in the submold cavity 8, and the primary resin 13 spread to the limit of the inside of the main mold cavity 3 like the above It added so that it might become the amount in which the total of a primary resin and a secondary resin exceeds the capacity of a mold cavity from the aforementioned two-color-molding machine, while a piston 12 is evacuated from the inside of the submold cavity 8, as shown in drawing 3 , and at the time of a injection end, it controlled so that only a primary resin was injected. By evacuating a piston 12 from the submold cavity 8, the submold cavity 8 is expanded, the primary resin 13 in a concavity 6 is attracted through the derivation way 7 in the expanded submold cavity 8, the secondary resin 14 is drawn together with the primary resin 13 in a concavity 6 in connection with it, and it fills up with the primary resin 13 and the secondary resin 14 in a concavity 6. When mold goods were investigated, at least 50% or more of core layers existed in boss circles from the nose of cam at each point (30mm, 20mm, and 10mm), and it has checked that the impossible thing for which it protrudes and a core layer is formed even in a part for the point of the section was possible with the conventional means. Drawing 4 shows the filling factor of the secondary resin in each point with the example which operated the example of a comparison which does not operate the aforementioned piston, and the piston. In addition, what is necessary is to cut the resin with which it filled up in the submold cavity 8 in the fraction of the derivation way 7 after the completion of molding, and just to separate it.

[0009] Thus, if it fills up with the primary resin 13 and the secondary resin 14 in a concavity 8, it becomes the structure with the same property as a parent, the core layer of a parent and the boss section is continuing mutually, and the boss section of mold goods of an one-element is also high. and the above -- operation of this invention is possible using established equipment by [with the metal mold equipped with metal mold by established equipment] exchanging

[0010] By the way, in order to depend for the restoration pattern of a secondary resin on the balance of the rheology property with a primary resin greatly, For example, when a secondary resin has high viscosity compared with a primary resin, there are few rates of a secondary resin. As the secondary resin 14 did not spread broadly so that it might illustrate to (a) of drawing 5 , it spreads broadly so that it may illustrate to (b) of drawing 5 , when reverse, and it said that most was occupied by the secondary resin 14 If the combination of a primary resin and a secondary resin changes also in the mold cavity configuration of the same configuration, naturally the restoration patterns of a secondary

resin also differ, and if they are thickly short when the whole mold cavity and the configuration of a concavity are thinly [, for example] long, even if it will change, the restoration pattern into a mold cavity or a concavity is greatly different. Therefore, it considers so that the timing which operates a piston, a speed, a stroke, etc. may be controlled by the difference in the balance of both rheology.

[0011] Since the hydraulic circuit is indispensable to the making machine, an oil hydraulic cylinder can be suitably used for an operation of the aforementioned piston, and injection timing can control easily gathering and carrying out the retardation operation of the injection start signal of for example, a two-color-molding machine etc. Moreover, as for an operation of a piston, it is desirable to be also able to use actuators other than an oil hydraulic cylinder, and to enable adjustment of timing of operation or a speed according to the configuration of the main mold cavity. Furthermore, the capacity of a submold cavity so that it may illustrate to (a) of drawing 6 So that the amount of evacuation of a piston 12 is restricted using a spacer 15, and the amount of the primary resin drawn in the submold cavity 8 may be reduced or it may illustrate to (b) of drawing 6 The amount of advances is stopped so that space 17 may be formed in the submold cavity 8 using a spacer 16, and the inside of the aforementioned space 17 can presuppose that adjustment of the maximum capacity and capacity variation of a submold cavity is possible for making a piston evacuate and drawing compulsorily etc., after a resin flows in. Of course, two or more submold cavities from which a size is different are prepared, and you may exchange. In addition, in the aforementioned example, although the piston is compulsorily evacuated with the oil hydraulic cylinder in case of a capacity expansion of a submold cavity, the aforementioned piston and the piston rod of an oil hydraulic cylinder are not connected, but an oil hydraulic cylinder makes a piston march out in a submold cavity, only a piston rod is retreated at the time of a capacity expansion, and the piston in the advance status can retreat by ***** injected in the main mold cavity. Moreover, the capacity of a submold cavity prepares a breaker style for example, in a derivation way, and not only making it change continuously but does not interfere as capacity adjustable structure where a breaker style switches the submold cavity of the minimum capacity to the maximum in an open operation of a breaker style in the state of lock out.

[0012] Although submold cavities are formed successively by only the concavity in the aforementioned example, the submold cavities 18 can be formed successively also at the point grade of the main mold cavity 3 which is distant from the gate 5, and the secondary resin in the main mold cavity 3 can be distributed over a nose of cam side so that it may illustrate to (a) of drawing 7 . In this case, the structure which makes the capacity of a submold cavity adjustable, and the structure of a fixed capacity where a capacity does not change are sufficient as the submold cavity 18 formed successively at a nose of cam by it not only evacuating a piston compulsorily, but being put back by the pressure of the resin injected in the main mold cavity.

[0013] Furthermore, the successive formation position of a submold cavity -- it not only forms a submold cavity in the vegetation orientation of a lug fraction, but to the vegetation orientation, as shown in (b) of formation or the drawing 7 , it forms every one submold cavities 8 and 8 in the side at the right-and-left both sides of a concavity 6 -- a number, capacity adjustable structure, etc. can be suitably changed within limits which do not deviate from the meaning of this invention. The thing which was prolonged for a long

time like a crossarm by preparing many submold cavities and for which it protrudes and a secondary resin is introduced even at the nose of cam of the section is not impossible, either. And in the technique of this invention, the injection timing of a primary resin and a secondary resin and the expansion timing of a submold cavity are suitably changed according to the conditions of the gestalt which the modality and product of a resin demand.

[0014]

[Effect of the Invention] According to the sandwiches molding technique of this invention, you can ride on flowing in which a primary resin is drawn in a submold cavity, and the primary resin is drawn, and can make it filled up with a secondary resin in a concavity by expanding the capacity of a submold cavity. The equipment which prepared the piston marched out and evacuated to a **** mold cavity can enforce easily the resin sandwiches molding technique of the aforementioned this invention, and since the mold goods formed by the aforementioned technique protrude and the core layer is formed in circles, the property of the lug section serves as the same level as a parent. And if they become easy [structure] by attitude operation of a piston about the capacity of a mold cavity since adjustable, then a movable fraction are only pistons, two or more submold cavities are prepared or the capacity expansion speed of a submold cavity is made adjustable to the one lug section, it can correspond also to the different lug section. Furthermore, as for the resin cast of this invention, the merit of sandwiches molding is efficiently employed also in the lug section.

[Brief Description of the Drawings]

[Drawing 1] It is explanatory drawing showing the equipment for enforcing the resin sandwiches molding technique concerning this invention.

[Drawing 2] The capacity of a submold cavity is explanatory drawing of the injection pattern in the minimum status.

[Drawing 3] It is explanatory drawing of the injection pattern in the status that the capacity of a submold cavity was expanded.

[Drawing 4] It is the comparison table having shown the difference between the example of a comparison, and an example.

[Drawing 5] It is explanatory drawing which illustrated the difference in a injection pattern with the combination from which viscosity is different.

[Drawing 6] It is explanatory drawing of the example of change.

[Drawing 7] It is explanatory drawing of the example of change.

[Drawing 8] It is explanatory drawing having shown the typical example of sandwiches mold goods.

[Drawing 9] It is explanatory drawing of the conventional example.

[Description of Notations]

1 -- .. -- a primary cylinder and 2 -- .. -- a secondary cylinder and 3 -- .. -- a main mold cavity and 4 -- .. -- metal mold and 5 -- .. -- the gate and 6 -- .. -- a concavity and 7 -- .. -- a derivation way and 8 -- .. -- a submold cavity and 9 -- .. -- a sprue and 10 -- .. -- a nozzle and 11 -- .. -- an oil hydraulic cylinder and 12 -- .. -- a piston and 13 -- .. -- a primary resin and 14 -- .. --

[0008]

Next, according to the inventive method, the molding operation is carried out as follows. Prior to filling resin, the piston 12 is advanced into the auxiliary cavity 8. At a time when the main cavity 3 is full of the primary resin 13 as shown in Fig. 2, the piston 12 is retreated from the auxiliary cavity 8 as shown in Fig. 3, and simultaneously therewith, the primary resin and the secondary resin are additionally supplied from the two-color molding machine so that a total amount of the primary resin and the secondary resin exceeds a capacity of the cavity. Thus, at a final stage of the ejection, solely the primary resin is ejected. By retreating the piston 12 from the auxiliary cavity 8, the auxiliary cavity 8 expands, into which is sucked the primary resin 13 in the recess 6 through the introduction path 7. Accompanied therewith, the secondary resin 14 is sucked in the recess 6 together with the primary resin 13 to fill the recess 6. By inspecting the molded product, it was confirmed that the core layer having a thickness of at least 50% or more exists at points apart 30 mm, 20 mm and 10 mm from a tip end of the boss. This means that it is possible to form the core layer even in a tip end portion of the protrusion, which was impossible by the conventional means. Fig. 4 shows the filling ratios of the secondary resin at the above-mentioned points of the molded products obtained from Comparative example in which the piston has not operated and Example of the present invention in which the piston has operated. In this regard, the resin filled in the auxiliary cavity 8 may be cut off at a point corresponding to the introduction path 7 after the completion of the molding operation.